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Title: Objectively Measured School Day Physical Activity Among Elementary Students in the United States and Finland

Year: 2016

Version:

Please cite the original version:

Yli-Piipari, S., Kulmala, J. S., Jaakkola, T., Hakonen, H., Fish, J. C., & Tammelin, T. (2016). Objectively Measured School Day Physical Activity Among Elementary Students in the United States and Finland. Journal of Physical Activity and Health, 13 (4), 440-446. doi:10.1123/jpah.2015-0335

Note: This article will be published in a forthcoming issue of the *Journal of Physical Activity & Health*. This article appears here in its accepted, peer-reviewed form, as it was provided by the submitting author. It has not been copy edited, proofed, or formatted by the publisher.

Section: Original Research

Article Title: Objectively Measured School Day Physical Activity Among Elementary Students in the United States and Finland

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Running Head: Objectively measured physical activity

Journal: *Journal of Physical Activity & Health*

Acceptance Date: September 21, 2015

DOI: http://dx.doi.org/10.1123/jpah.2015-0335

"Objectively Measured School Day Physical Activity Among Elementary Students in the United States and Finland"
by Yli-Piipari S et al.
Journal of Physical Activity & Health

Abstract

Schools are in a unique position to ensure that all students meet the current physical activity (PA) recommendations. This study aimed to examine 1st to 3rd grade elementary students' accelerometer measured school day PA in the United States (U.S.) and Finland. The sample consisted of 200 students (107 girls, 93 boys; ages 6 to 8) and their school day PA was monitored with hip-worn ActiGraph GT3X+ accelerometers across a 5-day school week and the thresholds 100 and 2,296 count per minute were used to separate sedentary time, light PA and moderate-to-vigorous PA (MVPA). On an average school day, students were engaged in MVPA for 20.0 min in U.S. and 24.1 min in Finland PA. Students' school-day MVPA was 9 to 16 minutes higher during physical education (PE) days compared to non-PE days (U.S: 25.8 vs. 16.6 min/day; Finland: 36.3 vs. 20.1 min/day). Girls had less MVPA and more sedentary time compared to boys in both samples. Study highlights both the role of PE and other school day physical activities in meeting PA guidelines. Policy measures are needed to change the structure of the school day and enhance PA to ensure that students meet the PA recommendations.

Keywords: accelometry, school health, school health promotion

Physical activity (PA) has positive effects on individuals' physical and mental health[1.] Insufficient levels of PA have contributed to increasing prevalence of overweight and obesity among youth.[2-4] Despite overwhelming evidence of health benefits of regular PA and international efforts to educate and engage individuals in PA, most children and adolescents are not sufficiently physically active.[5] For instance, accelerometer data from the National Health and Nutrition Examination Survey have shown that in the United States (U.S.) only 42% of children (6-11yr) meet the national PA guideline of at least 60-minutes of daily moderate-to-vigorous intensity PA (MVPA), and fewer than 8% of adolescents (12-19yr) achieve this goal.[6] A similar trend can be seen across western world. In Finland, the northernmost member country of the European Union, only 50% of elementary school students (7-12 years) and 17% of secondary school students (13-17 years) achieve the 60-minutes of MVPA recommendation.[7]

Influential actors, such as the U.S. Surgeon General Regina Benjamin and the Institute of Medicine, have identified schools as an ideal institutional setting for PA promotion.[8,9] School students' PA during school days can be increased by providing regular physical education (PE), adopting standardized high-quality PE curricula, providing daily recess, integrating PA in classrooms, modifying school playgrounds to promote active play, and implementing afterschool PA programs.[10] School day PA is important because it has shown to contribute to several health markers and behaviors, including body mass index (BMI)[11] and general PA behavior[12]. It has been showed that 150 minutes of weekly PE is associated with a decline of 1.56 BMI percentile units for boys, whereas 20 minutes of daily recess is associated with an additional decrease of .74 BMI percentile units for elementary school students overall.[11] The study by Bassett et al.[12] reviewing 300 studies published 1995-2011 (85 high level articles were included in the review) showed daily mandatory PE with standardized curriculum to contribute 29 minutes to daily

MVPA, whereas classroom activity breaks contributed to 19 min/day and modified recess five min/day MVPA. In addition, research has shown that children who attend regularly PE are more physically active compared to those who attend PE less often,[13,14,15] and the binding PE requirements can increase both PA participation and intensity of PA among high school students.[13] It is noteworthy that boys have found to be more physically active during school days[16,17] compared to girls but it has been shown that these sex differences are more due to recess[17,18] and lunch break[17] PA but not PE PA.[17]

Despite the evidence indicates that each additional minute of school day MVPA is associated with an additional 1.14 increase in total MVPA,[19] the U.S. schools have dramatically reduced students' PA opportunities during the school day.[20,21] For instance, as a result of the implementation of the No Child Left Behind Act, in five years elementary schools increased the amount of time devoted to reading by 47% and mathematics by 37%. On the contrary, time for PE and recess decreased 35% and 28%, respectively.[24] Finland, however, has not followed the global accountability movement that has lead to increases in academic instructional time and reductions in children's school day PA opportunities.[22,23] Finnish elementary school students' school days are considerably shorter compared to the U.S. students, 1st and 2nd graders weekly instructional time being 19 hours and 3rd graders 24 hours per week in Finland[23] and 35 hours in the U.S.[23] In addition, Finnish students are provided with 15 minutes of recess toward 45 minutes of instructional time, whereas elementary students in Tennessee have 0 to 20 minutes of recess in a day.

Although large international cross-country comparisons of health behaviors (e.g., Health Behavior in School-Aged Children; see www.hbsc.org) and academic performance (e.g., Programme of International Student Assessment: see www.oecd.org/pisa) have shed a light on

health status and school achievement between different countries, there is a lack of studies examining differences in school day PA among different countries. In general, international comparisons have shown Finnish children to be healthier and to do better in school compared to children in the U.S.[24,25] Annual Report Card on Physical Activity of Children and Youth[26] comparing health indicators between 15 countries showed Finnish K-12 education to be among the best in school health policies, with 61% to 80% of the K-12 Finnish schools meeting a recommended healthy school benchmark.[27] As a comparison, the U.S. score, based on high school data only, showed 41%-60 % of the U.S. schools to meet the benchmark.[28] In the U.S., Long et al.[19] have shown 6- to- 11-year old boys to have 36.9 minutes (5.2 min/h) of MVPA during school hours, with contributing to 46% of their total 85.9 minutes of daily MVPA. In addition, the study showed girls to be less active than boys, girls engaging in MVPA 4.0 minutes per each school hour, that is 43% of their total 66 minutes of daily PA.[19] In Finland, the study by Tammelin et al. [7] have shown 1 and 2 graders (6- to 8-year olds) to have 6.3 min/h (boys) and 5.1 min/h (girls) MVPA during an average school day, whereas 3 and 4 graders (8- to 10-year olds) MVPA levels were slightly lower among both boys (5.4 min/h) and girls (4.3 min/h).

Based on the findings of the previous studies and recognizing the differences in the school-day structure between these two school systems, the aim of the study was to examine 1st to 3rd grade students' objectively measured school day PA in Memphis, U.S. and in Jyväskylä, Finland. The following three hypotheses were tested. It was hypothesized that:

(1) in both school systems, school day does not provide enough PA to reach the daily 60 min of MVPA[7,19]

(2) across the sample students will be less sedentary and have more MVPA during PE days compared to non-PE days.[10,15-17]

(3) boys compared to girls will be less sedentary and have more MVPA an average schoolweek.[7,19]

Methods

Research Context

Academic education can be structured in a way that every student has an opportunity to be physically active during the school day. To review elementary school students' school day PA levels in different school settings, our research comprised schools from Memphis, Tennessee and Jyväskylä, Finland (Table 1). Memphis is located in the Mid-South region of the U.S. and has an estimated population of approximately 650,000. The school district of the area, Memphis City School district, educates almost 112,000 students yearly.[29] As a comparison, Jyväskylä, 8th biggest city in Finland, is located in the Central Finland and has a population over 133,000, with 11,500 school students in the Jyvaskyla School District.[30] Currently, the required annual numbers of days of instruction in Memphis is 180 days, whereas in the Jyväskylä has 189 yearly instructional days. In Memphis, one to third grades are enrolled in 35-hour school week, whereas in Jyväskylä, students have either 19 (grades 1 and 2) or 24 (grade 3) weekly school hours. Students in Memphis have a 30 minutes PE class twice per week, whereas students in Jyväskylä had either two or three 45 minutes PE classes in a week (in our sample schools had two weekly hours). The most significant cross-country differences between different school districts are evident in recess. Whereas Memphis schools provide 1st grade students with 35 minutes of daily unstructured recess and 2nd and 3rd grade students with 20 minutes for, in Jyväskylä students have 15 minutes unstructured recess against every 45 minutes of the instruction (almost 50 min daily).

The U.S. data were collected in the Mid-South area during September and October with average monthly temperatures ranging from 54 to 74 and from 65 to 85 °F, respectively. The data in the Finnish schools were obtained during September, October and early November. During the data collection temperatures averaged from 39 to 55 °F." Participants' main source of PA was school PE and recess. Students in the both schools spent their recess outside and participated in a traditional PE unit following a standard elementary school PE curriculum.

Participants

This sample comprised 200 1st, 2nd, and 3rd grade school students in an elementary school in urban metropolitan city in the Mid-South U.S. (32 girls, 29 boys) and two elementary schools in a mid-sized city in Central Finland (75 girls, 64 boys) (Table 2). Prior the study, the Institutional Review boards of the local universities (both the U.S. and Finland) as well as local school districts approved the study protocol. With the permissions of school principals, all students in each class (6 classes in the U.S. and 16 classes in Finland) were invited to participate. Seventy-five percent (U.S.) and 45% (Finland) of the students returned both the student consent and parental consent by the deadline. Participation in this study was voluntary and no extra credit was awarded for participation.

Instrumentation

Children's PA and sedentary time were measured objectively using the ActiGraph GT3X+ in the U.S. and GT1M and GT3X accelerometers in Finland. Only vertical axis was used in the analyses, and ActiGraph monitors' vertical axis output in the different models of GT-series has been studied to be almost identical.[31,32] ActiGraph sensors have been widely studied and shown adequate reproducibility, validity and feasibility in children and adolescents.[33]

Procedures

Accelerometers were distributed face-to-face at schools. Children were instructed to wear an accelerometer attached to the right hip with an elastic band for five consecutive school days during school-hours and accelerometers were attached to students when they arrived to their homeroom in the morning and devices were collected in afternoon a few minutes before they left the school. In Finland, monitors were worn for seven consecutive days, but the data were analyzed for five days school-hours only. A grace period of 15 minutes was allowed and, thus, the length of the U.S. school day was six hours and 45 minutes. Non-wearing time was calculated as periods of more than 30 minutes of consecutive zero counts. At least 80% of wearing time in school was required. Based on Trost et al.[34] recommendation, Evenson et al.[35] cut-points were used to calculate time spent in different activity intensity classes (sedentary time < 100 cpm, light PA 101-2,295 cpm, moderate PA (MPA) 2,296-4,011 cpm and > 4,011 cpm for vigorous PA (VPA). 20,000 cpm upper limit was set to avoid spurious data.[36]

Data Analysis

BMI was calculated as kg/m^2 based on measured body weight and height. Means and standard deviations for total steps/school day were computed as well as time spent in different intensity PAs (Table 1). Since various schools in the current sample had varying lengths of instructional hours, PA min/h were also computed. Previous studies have shown school PE to be a major source of PA during school days[12] and, thus, the amount and type of school-day PA were calculated for the school-days with and without PE. Independent *t* tests were used to examine differences between two samples and sexes.

Results

The data showed Finnish elementary school students to be 1.4 years older and weight 2.9 kg more than U.S. students (Table 2). This is due to the different enrollment policies. Finnish students were able to enroll to the first grade the year they turn seven, whereas the U.S. students' first grade enrollment was possible if they turned six during the last five months of the school year.

Hypothesis 1: School Day PA Contributions Toward PA Recommendations

The study showed students to be sedentary most of the school day, with students being more sedentary in the U.S. than in Finland (38.9 vs. 36.4 min/h; $p < .001$) (Table 2). The U.S. students engaged more in school day light intensity PA (LPA) compared to Finnish students (19.5. vs. 18.5 min/h; $p < .001$). Furthermore, the study showed students' limited engagement in MPA and VPA in both countries Finnish students engaging more than the U.S. students in MPA (3.2 vs. 2.1 min/h; $p < .001$) and VPA (1.9 vs. 1.0 min/h; $p < .001$) during an average school day. In addition, Finland's school day PA contributed more toward recommended 60 minutes of daily MVPA (40%, 24.1 min/day) compared to the U.S. school PA (33%, 20.0 min/day) ($p < .001$) (Table 2).

Hypothesis 2: PA during PE and Non-PE Days

In both countries, students were more sedentary during the non-PE school days compared to the school days they had PE (U.S: $p = .003$; Finland: $p < .001$). Whereas Finnish students engaged more in LPA during the days they had PE compared to days without PE ($p < .001$), there were no differences in the U.S. sample. In both countries, students were more engaged in MPA and VPA during PE days compared to non-PE days ($p < .001$). In addition, students

engaged more in MVPA during PE days (U.S. PE day 25.8 min/day [meeting 43% of the PA recommendation] and non-PE day 16.6 min/day [28%]; Finland PE day 36.3 min/day [61%] and non-PE day 20.1 min/day 36.3[34%]). The difference in meeting recommended MVPA levels during PE days and non-PE days was statistically significant in both samples ($p < .001$).

Hypothesis 3: Sex Differences in Sedentary Time and PA during School Day

Across the samples, girls were more sedentary compared to boys (U.S: $p < .001$; Finland: $p < 0.001$) and these sex differences were stable in PE and non-PE days. Boys engaged more in MPA and VPA compared to girls in both countries ($p < .001$), but there were no statistically significant sex differences in LPAs. There were no sex differences in MPAs and VPAs between non-PE and PE days (Table 2). In the U.S., daily school PA contributed on average 39% to 60 minutes of MVPA for boys (PE day 49%, and non-PE day 33%) and on average 28% to girls (PE day 37%, and non-PE day 22%). Furthermore, in the Finnish sample, daily school PA contributed on average 45% to 60 minutes of MVPA for boys (PE day 65%, and non-PE day 37%) and on average 36% to girls MVPA (PE day 56%, and non-PE day 31%).

Discussion

The aim of the study was to examine 1st to 3rd grade elementary students' objectively measured school day PA in the Memphis U.S. and Jyväskylä Finland. The findings revealed that despite considerably shorter school days, the school day structure in Finland that emphasizes frequent recess time contributed 40% toward the recommended minimum of 60-minutes of daily MVPA whereas the school day contribution was 33% in the U.S. sample. Students' school-day MVPA was 9 to 16 minutes higher during physical education (PE) days compared to non-PE days and girls had less MVPA and more sedentary time compared to boys in both samples.

School Day PA Contributions Toward PA Recommendations

The study showed that students were sedentary most of the school day, with American students more sedentary (65% of the time) compared to Finnish students (61%). These findings are accordance with previous studies that have shown school students to be engaged in sedentary activities most of the school day.[8,37] Keeping in mind 7-hour school days in which students in the U.S. sample were enrolled in, the students were sedentary almost five hours daily. These findings are a concern considering the impact of daily sedentariness on heightened risk of adverse health outcomes, including overweight and obesity, among school-aged children.[38,39] The study showed that the U.S. students had more LPA (33% [U.S.] and 30% [Finland] during an average school day), whereas Finnish students had more MPA and VPA during the school day. Students MPA was limited to 2% to 4% and in VPA to 3% to 5% of the school-day in the U.S. and Finland, respectively. It has been shown that elementary school students' school-day MPA and VPA occur mainly during PE and recess, whereas LPA can occur during PE and recess, as well as transitions between classes and lunch.[12] The study showed that, in both countries, school day PA was a significant contributor toward meeting the recommended daily 60-minutes of MVPA among both girls and boys. This supports the findings of the previous studies highlighting the potential and importance of school-day PA.[8, 10] While school day contributed 20 minutes toward the 60-minute recommendation in the U.S. sample, Finnish school-day contributed 4.1 minutes more despite considerable shorter school days (Finnish 1st and 2nd grades have only 19 weekly school hours compared to 35 hours of students in the U.S.). The low levels of school-day MVPA is a concern because PA at the higher end of the intensity continuum have stronger health benefits, relative to PA of lower intensities.[40-44] However, recent findings have shown that also LPA may have a positive effect in health adults[45] and elderly.[46] Although early evidence has

shown similar effect among adolescents[47], the health effect of LPA is yet to be determined on children.[48]

PA during PE and Non-PE Days

The study showed that PE has a positive impact on elementary school students' school day PA levels. This finding was consistent with previous literature showing that PE can significantly contribute to school students PA levels.[10,12,15-17,49] Students' participation in PE reduced students' non-MVPA by almost 16 and 20 min/day, increased MPA for 4 and 7 min/day and VPA for 6 and 7 min/day compared to non-PE days in U.S. and Finland, respectively. In both samples, students were more engaged in MVPAs during PE days corroborating the findings of the previous studies that have shown PE to be one of the key contributors of school day PA[12]. It is noticeable American students had two 25 minutes of PE weekly compared to Finnish students' two 45 minutes of PE weekly (13% of the students in the Finland's sample had 135 min of weekly PE).

Sex Differences in Sedentary Time and PA during School Day

In the present study, boys participated in more PA over the course of the school day than girls, aligning with previous literature that have identified similar sex disparities when examining school day PA.[15,16,49-51] These findings were consistent across our both samples as well as in terms of sedentary time, MPA, and VPA but not in terms of LPA. The study findings indicate that even during environment in which PA possibilities are very structured, such as classroom PA and recess, boys are physically more active compared to girls. In other words, when there was a time for low PA girls were more sedentary. Alternatively, when there were possibilities for PA boys engaged themselves with higher intensity than girls. However, when PE classes were

implemented boys were still more MVPA compared to girls but an average increase in MVPA was same for girls and boys. This finding indicates that both sexes benefit equally from having school PE. Although this sex difference is well reported across school-day PA[17,18] as well as general PA[52], only few studies have tried to provide answers why these sex differences exist. In terms of PA participation, scholars have posited that gender differences might be due to the adoption of gender-role stereotypes, which can occur because of children's need to feel socially accepted.[53] For example, boys may be expected by others to play masculine-typed tasks (e.g., basketball and football), while girls may be expected to participate in feminine-typed tasks (e.g., dance and gymnastics). These socially constructed gender-role stereotypes might pressure both boys and girls to behave in ways that will satisfy the expectations of society. This may have some truth in terms of sports, PE, and PA, but these sex differences were evident not only in PE but during across school days. Previous studies have provided an alternative explanation for sex differences, suggesting that girls engaging in verbal games, conversation, and socializing, while boys tend to interactive more through physically active games.[54] It is possible, therefore, that the reported sex differences were related to different gender characteristics. In other words, boys preferred more physically active games compared with girls and they engage to activities with higher intensity. Interestingly, these sex differences were not that clear in LPAs. In the U.S. sample, sex differences in LPA were evident only during non-PE days, while in the Finnish sample, differences occurred during the days students had PE. Maybe this finding is related to the earlier finding of the study, indicating that in the U.S. sample, PE contributed mainly to MPA and VPA. If that is the case, the sex differences in American students occurred due to activity during recess.

Limitations

This study utilized a convenience sample in both countries and, thus, the findings are not generalizable. In addition, this study was conducted during one authentic school week and it did not control the content or intensity of PE classes. Previous studies have shown that standardized PE curricula and PE specialists contribute positively to students' PA and PA intensity during PE.[55-56]

Conclusions

The study showed students both in Memphis (38.9 min/h) and Jyväskylä (36.4 min/h) to be sedentary most of the school-day, with limited engagement in MPA and VPA (1 to 3.2 min/h). The study showed that in Finland's school system, in which students have considerably shorter school days with more unstructured recess and free-time, seems to be less sedentary and had more MVPA compared to the U.S. students. In addition, study highlights both the role of PE and other school-day physical activity in meeting national PA guidelines. In both countries, PE contributed to less sedentary time and higher levels MVPA. Finally, the study showed that even in school environment where PA possibilities are highly structured, girls were more sedentary compared to boys. It can be concluded that, additional PE or recess time along with additional classroom PA breaks would increase students' activity time and could help students achieve the recommended 60 min of daily MVPA.

Human Subjects Approval Statement

This study is approved by the Institutional Review Board of the University of Memphis (ID: #2685) and the Ethical Committee of the University of Jyväskylä (ID: #214).

ACKNOWLEDGEMENTS

Ministry of Education and Culture of Finland

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"Objectively Measured School Day Physical Activity Among Elementary Students in the United States and Finland"
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Table 1. Representation of the school-day structure across elementary schools grades 1 to 3

	Memphis, U.S.				Jyväskylä, Finland			
	1st Grade	2nd Grade	3rd Grade	Mean *(SD)*	1st Grade	2nd Grade	3rd Grade	Mean (*SD*)
Yearly instructional days	180	180	180	180 (0)	189	189	189	189 (0)
Weekly instructional minutes	2100	2100	2100	2100 (0)	1140	1140	1440	1240 (173)
Physical Education, times per week	2	2	2	2 (0)	2	2	2	2 (0)
Physical Education, min per week	50	50	50	50 (0)	90	90	101	96 (15)
Recess, min per week	175	100	100	125 (43)	233	223	261	246 (32)
Lunch, min per week	100[a]	100[a]	100[a]	100 (0)	100[b]	100[b]	100[b]	100 (0)

Note. [a] Lunch is consumed in classrooms. [b] Lunch is consumed in a cafeteria and it is a part of mandatory daily recess time. *SD* = standard deviation.

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Table 2. Cross-sample and gender differences in amount and intensity of school-day physical activity among elementary school students.

	Memphis.				Jyväskylä				Difference between samples		
	Boys *n*=29	Girls (*n*=32)	All (*n*=61)	p^1	Boys (*n*=64/62*)	Girls (*n*=75/68*)	All (*n*=139/130*)	p^1	p^2	p^3	p^4
Age, years	6.9 (0.8)	7.3 (1.1)	7.1 (1.0)	.001	8.3 (1.0)	8.7 (1.0)	8.5 (1.0)	.014	**<.001**	**<.001**	**<.001**
Body height, cm	128.5 (7.2)	130.3 (10.5)	129.3 (9.9)	.132	132.8 (7.9)	133.8 (7.1)	133.3 (7.5)	.419	**<.001**	**<.001**	**<.001**
Body weight, kg	27.8 (4.5)	27.7 (8.4)	27.7 (6.9)	.091	30.0 (5.5)	31.1 (6.4)	30.6 (6.0)	.255	**<.001**	**<.001**	**<.001**
Body mass index	16.8 (2.1)	16.3 (2.9)	16.6 (2.6)	.109	16.9 (2.0)	17.3 (2.6)	17.1 (2.3)	.316	.630	**<.001**	**.005**
Sedentary time, min/h											
All days	37.2 (5.8)	40.1 (6.2)	38.8 (5.8)	**<.001**	35.3 (3.5)	37.4 (3.4)	36.4 (3.6)	**<.001**	**<.001**	**<.001**	**<.001**
Physical education day	35.8 (6.7)	38.7 (4.8)	37.3 (6.0)	**<.001**	31.9 (3.8)	34.1 (3.3)	33.1 (3.7)	**<.001**	**<.001**	**<.001**	**<.001**
Non-physical education day	38.0 (5.7)	41.3 (3.9)	39.6 (5.5)	**<.001**	36.7 (4.0)	38.6 (3.9)	37.7 (4.0)	**.006**	**.018**	**<.001**	**<.001**
Light physical activity, min/h											
All days	20.1 (4.7)	19.0 (4.9)	19.5 (4.7)	.079	19.0 (2.6)	18.1 (3.1)	18.5 (2.9)	.053	**.004**	**.011**	**<.001**
Physical education day	20.3 (4.7)	19.7 (4.1)	19.9 (4.4)	.280	20.1 (3.0)	19.0 (2.9)	19.5 (3.0)	**.044**	.643	**.048**	.147
Non-physical education day	20.0 (5.1)	17.0 (4.4)	19.2 (4.8)	**<.001**	18.5 (2.8)	17.7 (3.4)	18.1 (3.1)	.136	**.004**	.066	**<.001**
MPA, min/h											
All days	2.4 (1.1)	1.8 (1.1)	2.1 (1.1)	**<.001**	3.5 (1.0)	2.9 (.8)	3.2 (1.0)	**<.001**	**<.001**	**<.001**	**<.001**
Physical education day	2.8 (1.1)	2.2 (.8)	2.5 (1.0)	**<.001**	4.8 (1.3)	4.0 (1.3)	4.4 (1.3)	**.001**	**<.001**	**<.001**	**<.001**
Non-physical education day	2.2 (1.1)	1.6 (.7)	1.8 (1.0)	**<.001**	2.9 (1.1)	2.4 (1.0)	2.7 (1.0)	**.004**	**<.001**	**<.001**	**<.001**
VPA, min/h											
All days	1.2 (0.8)	.8 (1.0)	1.0 (0.8)	**.006**	2.2 (1.0)	1.7 (.9)	1.9 (.9)	**.001**	**<.001**	**<.001**	**<.001**
Physical education day	1.7 (1.1)	1.2 (0.7)	1.5 (0.9)	**<.001**	3.2 (1.6)	2.9 (1.4)	3.1 (1.5)	.151	**<.001**	**<.001**	**<.001**
Non-physical education day	0.9 (0.7)	0.4 (0.3)	0.6 (0.6)	**<.001**	1.8 (1.1)	1.3 (0.8)	1.5 (1.0)	**.004**	**<.001**	**<.001**	**<.001**
MVPA, min/h											
All days	3.6 (1.7)	2.6 (1.2)	3.1 (1.7)	**<.001**	5.7 (1.7)	4.6 (1.4)	5.1 (1.6)	**<.001**	**<.001**	**<.001**	**<.001**
Physical education day	4.5 (1.9)	3.4 (1.3)	3.9 (1.7)	**<.001**	7.9 (2.4)	6.9 (2.3)	7.4 (2.4)	**.010**	**<.001**	**<.001**	**<.001**
Non-physical education day	3.1 (1.7)	2.0 (1.0)	2.6 (1.5)	**<0.001**	4.7 (1.9)	3.8 (1.5)	4.2 (1.8)	**.002**	**<.001**	**<.001**	**<.001**
MVPA, min/all school day											
All days	23.5 (12.6)	16.8 (8.1)	20.0 (15.2)	**<.001**	26.7 (9.0)	21.8 (6.9)	24.1 (8.3)	**<.001**	**.010**	**<.001**	**<.001**
Physical education day	29.4 (12.6)	23.2 (8.3)	25.8 (11.2)	**<.001**	39.0 (12.6)	33.8 (12.7)	36.3 (12.9)	**.023**	**<.001**	**<.001**	**<.001**
Non-physical education day	20.0 (11.2)	12.9 (6.5)	16.6 (10.0)	**<.001**	22.1 (10.3)	18.3 (8.2)	20.1 (9.4)	**.021**	**.006**	**<.001**	**<.001**

Note 1. Standard deviations of the arithmetic means are presented in the parentheses.

Note 2. p^1 gender difference, p^2 cross-sample differences in boys, p^3 cross-country difference in girls, p^4 cross-sample differences. Statistically significant p values ($p < .05$) are presented in bold, * = number of subjects wearing monitor on physical education day.